# EM&I

PARTNERSHIP    INNOVATION    RESULTS

# Choosing the Right Measures -

# Prerequisite for Changing the Game

## Elliot Chikofsky, EM&I Fellow

| | | Form Approved OMB No. 0704-0188 |
|---|---|---|

# Report Documentation Page

| 1. REPORT DATE **APR 2010** | 2. REPORT TYPE | 3. DATES COVERED **00-00-2010 to 00-00-2010** |
|---|---|---|
| 4. TITLE AND SUBTITLE **Choosing the Right Measures - Prerequisite for Changing the Game** | | 5a. CONTRACT NUMBER |
| | | 5b. GRANT NUMBER |
| | | 5c. PROGRAM ELEMENT NUMBER |
| 6. AUTHOR(S) | | 5d. PROJECT NUMBER |
| | | 5e. TASK NUMBER |
| | | 5f. WORK UNIT NUMBER |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Engineering, Management & Integration Inc (EM&I),455 Spring Park Pl.Ste.350,Herndon,VA,20170-4727** | | 8. PERFORMING ORGANIZATION REPORT NUMBER |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) | | 10. SPONSOR/MONITOR'S ACRONYM(S) |
| | | 11. SPONSOR/MONITOR'S REPORT NUMBER(S) |

| 12. DISTRIBUTION/AVAILABILITY STATEMENT **Approved for public release; distribution unlimited** |
|---|

| 13. SUPPLEMENTARY NOTES **Presented at the 22nd Systems and Software Technology Conference (SSTC), 26-29 April 2010, Salt Lake City, UT. Sponsored in part by the USAF. U.S. Government or Federal Rights License** |
|---|

| 14. ABSTRACT |
|---|

| 15. SUBJECT TERMS |
|---|

| 16. SECURITY CLASSIFICATION OF: | | | 17. LIMITATION OF ABSTRACT **Same as Report (SAR)** | 18. NUMBER OF PAGES **23** | 19a. NAME OF RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| a. REPORT **unclassified** | b. ABSTRACT **unclassified** | c. THIS PAGE **unclassified** | | | |

**Standard Form 298 (Rev. 8-98)**
Prescribed by ANSI Std Z39-18

**How do you replace the hull and streamline the structure while the ship is steaming at full speed in rough waters?**

EM&I
PARTNERSHIP  INNOVATION  RESULTS
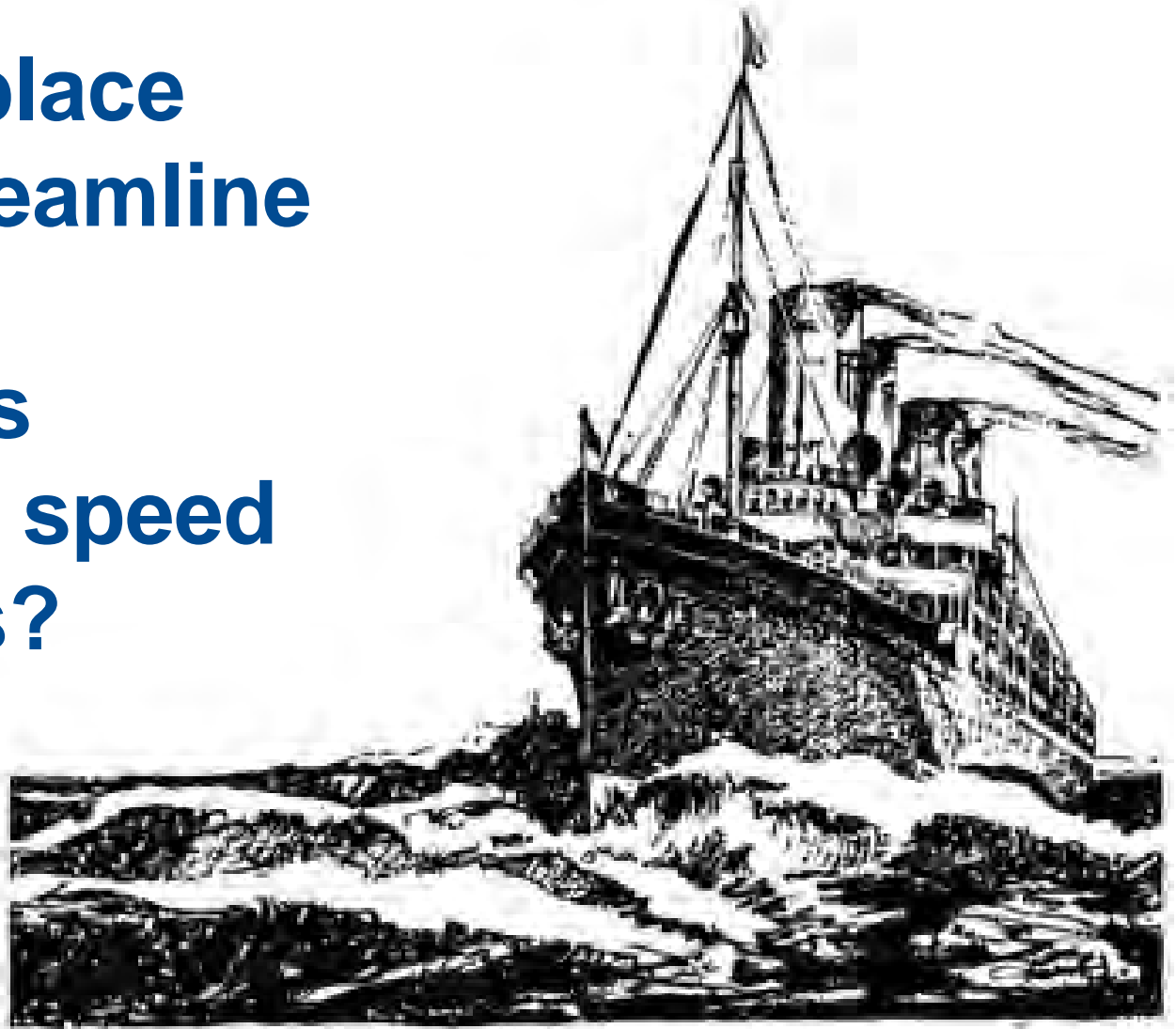
# Value, Architecture, and Performance

**Value Recognition**

**Value engineering involves understanding business value and making informed IT decisions that maximize value.**

- **Enterprise architecture puts adaptive frameworks in place that enable rapid response at the speed of today's business.**
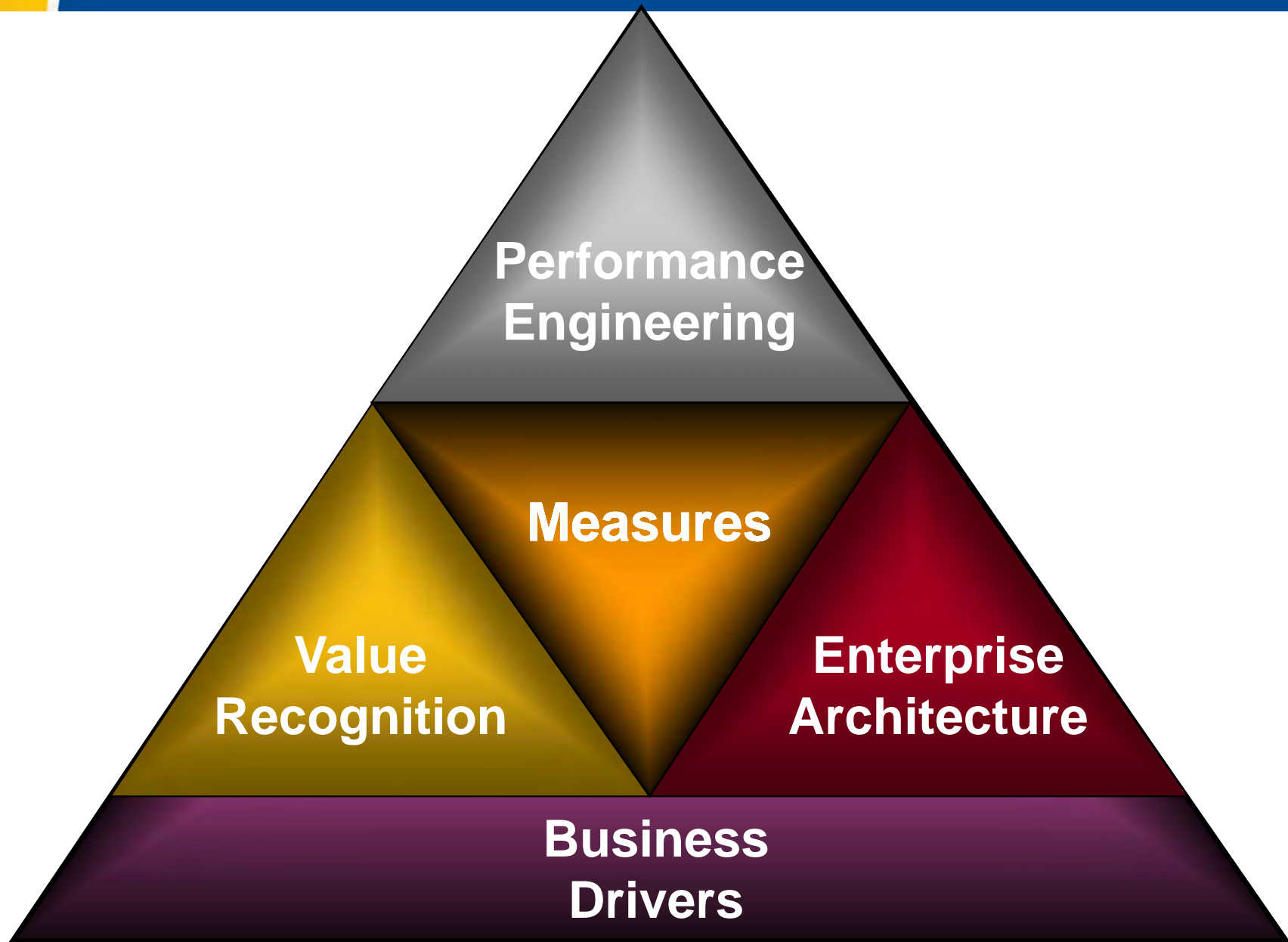
**Enterprise Architecture**

- **Performance engineering means measuring position, speed, and rate of change and being ready and able to act on those measures.**

**Performance Engineering**

**EM&I**
PARTNERSHIP   INNOVATION   RESULTS

# What Should We Measure?

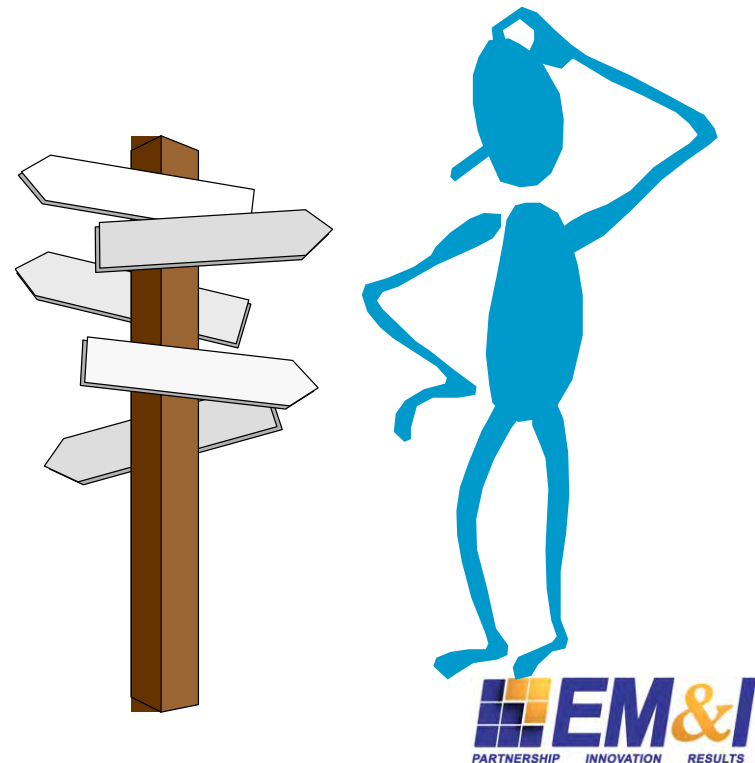"Would you tell me, please, which way I ought to go from here?"

"That depends a good deal on where you want to get to," said the Cat.

"I don't much care where--" said Alice.

"Then it doesn't matter which way you go," said the Cat.

"--so long as I get somewhere," Alice added as an explanation.

"Oh, you're sure to do that," said the Cat, "if you only walk long enough."

EM&I
PARTNERSHIP    INNOVATION    RESULTS

# Metrics Purpose

**Provide a "moving snapshot" of key performance indicators**

- Current status
- Position relative to targets
- Movement toward targets

**Provide "alerts" to identify critical action areas**

- Focus on leading, not lagging indicators
- Identification of expected bands of acceptable performance

**Communicate quantitative aspects of organizational goals in terms of targets and performance improvement**

# Why Measure?



COMPARISON     LOCATION     DIRECTION

PROGRESS     VELOCITY     RATES OF CHANGE
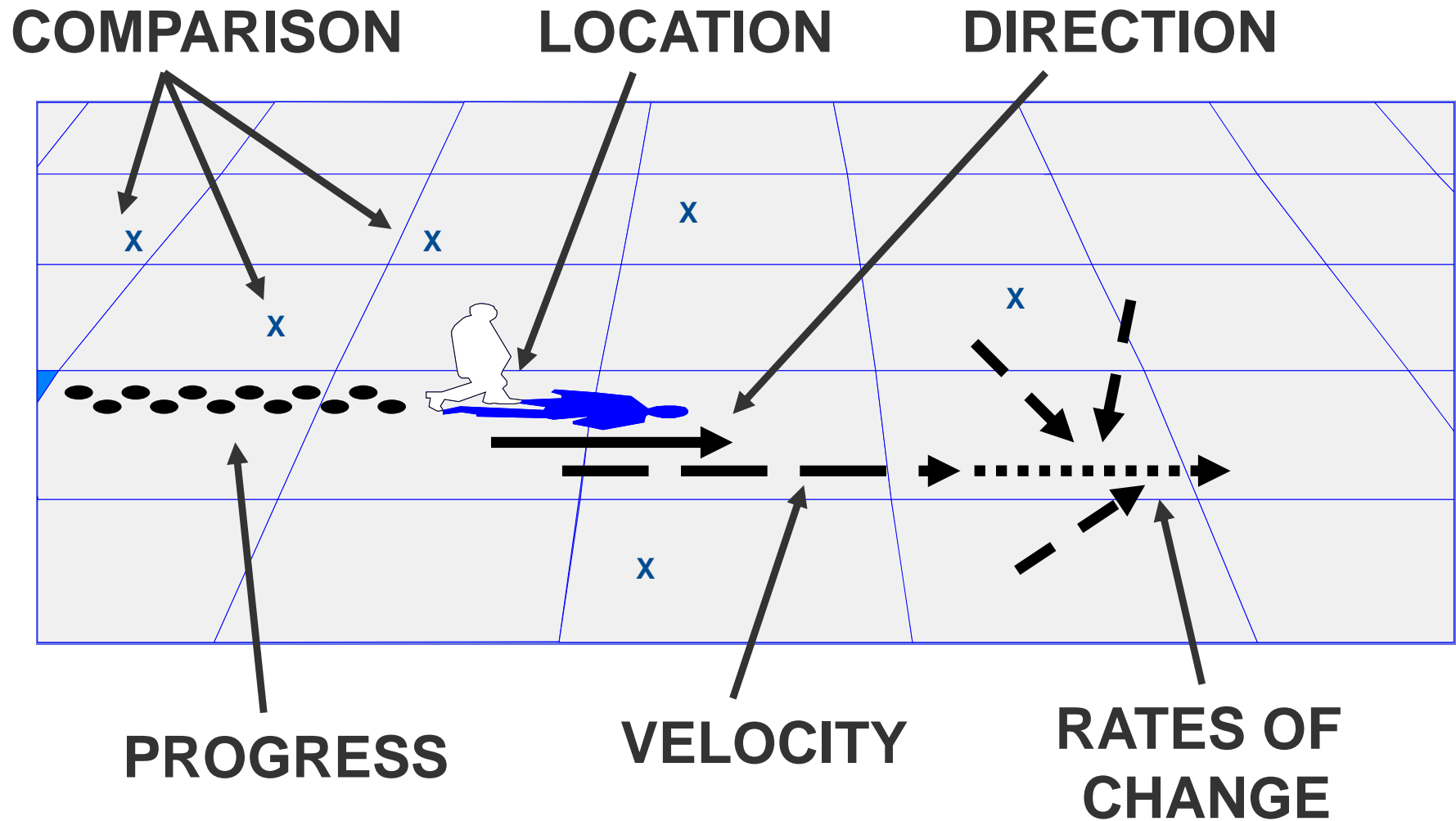
# IT / Business Alignment
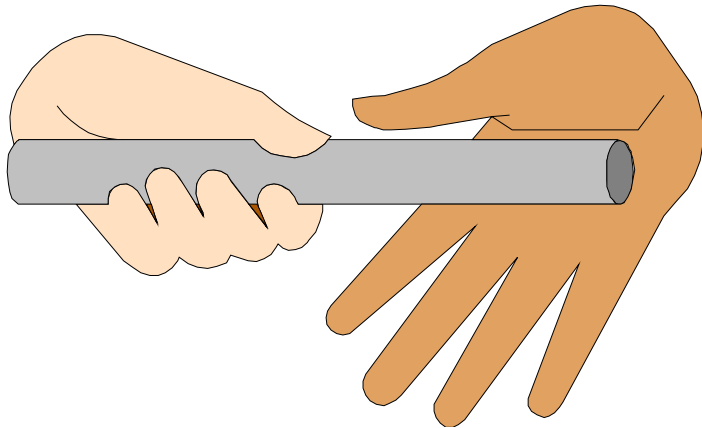
- The product of IT is NOT source code. It is improved business performance.

- Understanding and coordinating IT goals and measures with Business goals and measures is essential.

- IT processes are being managed as business processes that require cost / benefit analysis.

# Measures Must Be Clearly Mapped

**Structural Complexity**
**Training Profiles**
**Staffing Profiles**
**Technology Acceptance**

**IT Investment**
**ROI**
**Budget Control**
**Risk**
**Performance Profiles**
**Portfolio Investment**

**Investment**

**Change Profile**
**Technical Condition**
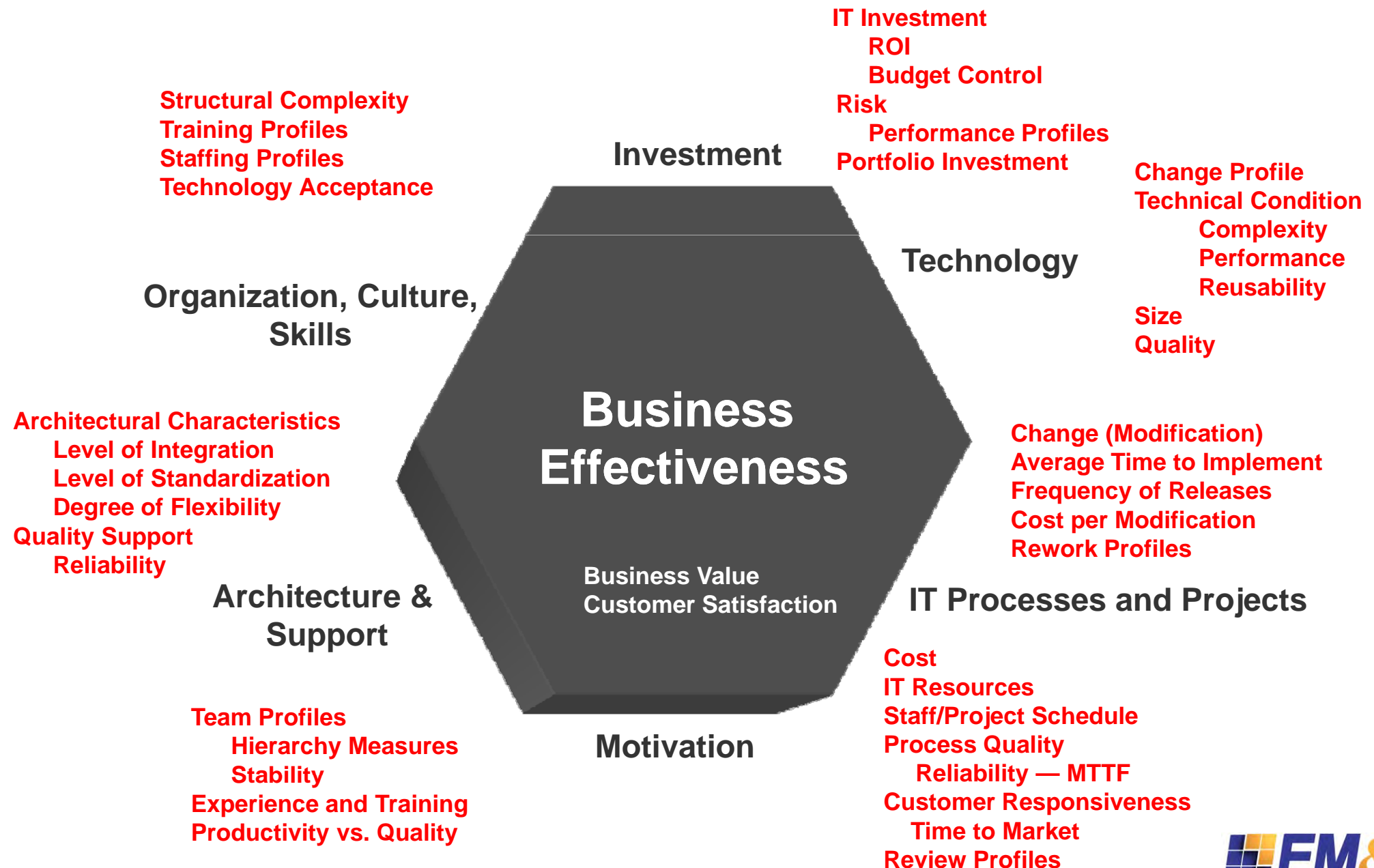**Complexity**
**Performance**
**Reusability**
**Size**
**Quality**

**Organization, Culture, Skills**

**Technology**

**Architectural Characteristics**
**Level of Integration**
**Level of Standardization**
**Degree of Flexibility**
**Quality Support**
**Reliability**

## Business Effectiveness

Business Value
Customer Satisfaction

**Change (Modification)**
**Average Time to Implement**
**Frequency of Releases**
**Cost per Modification**
**Rework Profiles**

**Architecture & Support**

**IT Processes and Projects**

**Team Profiles**
**Hierarchy Measures**
**Stability**
**Experience and Training**
**Productivity vs. Quality**

**Motivation**

**Cost**
**IT Resources**
**Staff/Project Schedule**
**Process Quality**
**Reliability — MTTF**
**Customer Responsiveness**
**Time to Market**
**Review Profiles**

EM&I
PARTNERSHIP   INNOVATION   RESULTS

# Meaningful Levels of Measurement
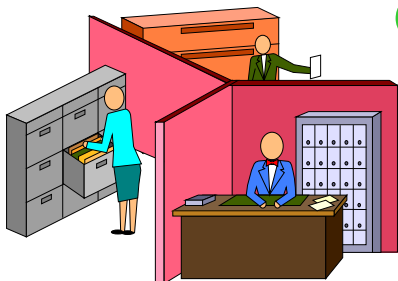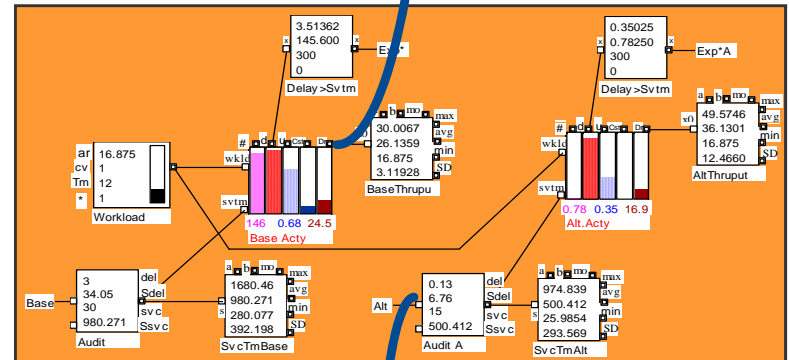
**Decision View**
- ROI
- Business Impact
- Price-performance
- Risk/Opportunity...
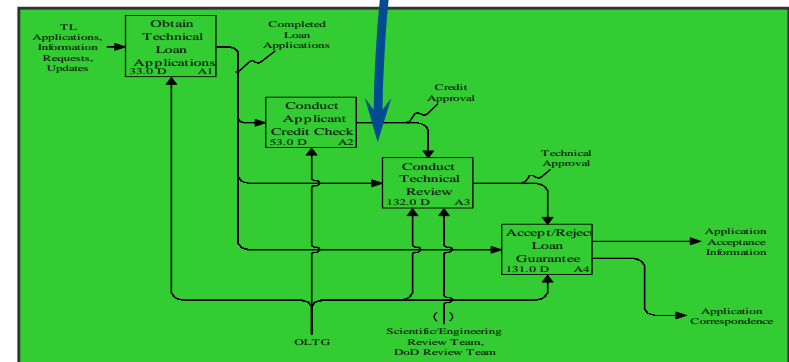
*Executive*
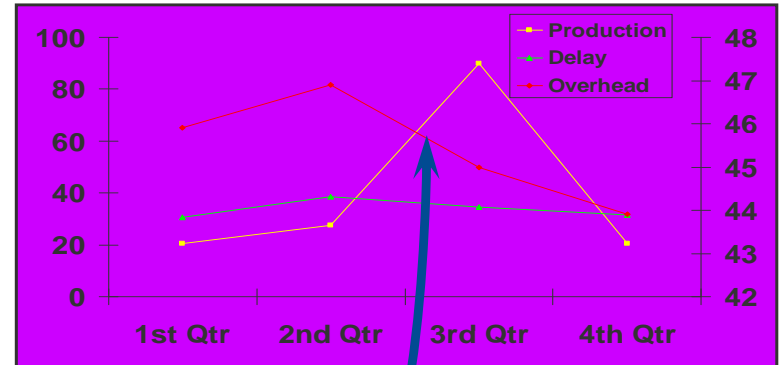
**Management View**
- Costs/Budget
- Schedule/Effort/Delay
- Standards
- Resource Availability...

*Manager*

**Operational View**
- Process/Activities
- Products/Specs
- Policy/Procedures
- Constraints/Guides...

*Operations*

# Measurement for Management Levels
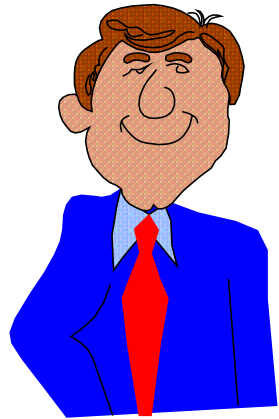


Project Management
Process Management
Product Management

Business Strategy

| Value | Impact | ROI | Margins | ... | Risk/ Opportunity |
| Staffing | Schedule | Costs | Effort | ... | Progress |
| Throughput | Change Rates | Cycle Times | Queues | ... | Productivity |
| Size | Complexity | Volatility | Reliability | ... | Quality |

EM&I
PARTNERSHIP    INNOVATION    RESULTS
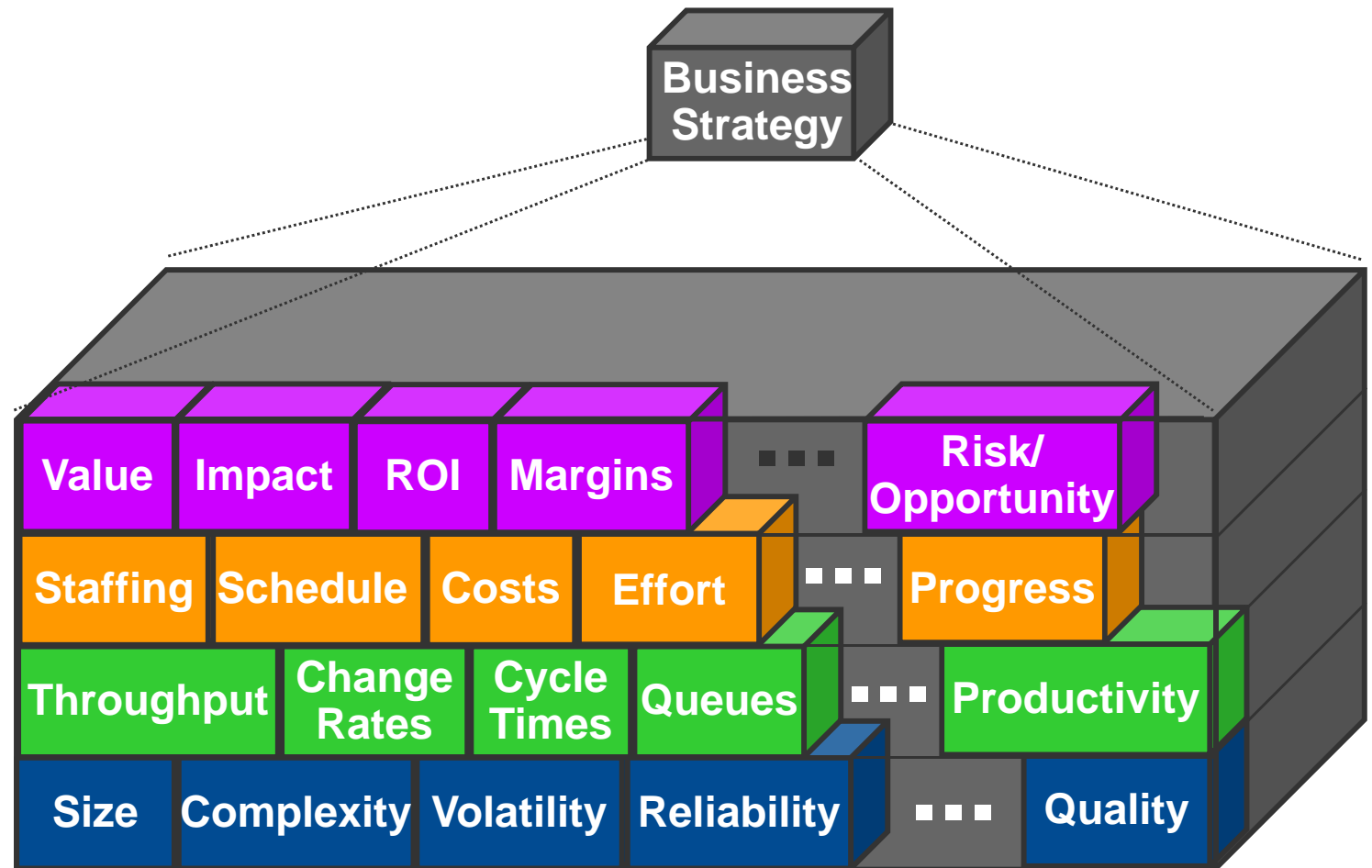
# Metrics Warehouse: From Measures to Strategy

| | People | Project | Process | Product |
|---|---|---|---|---|
| **Size**<br><br>**Effort** | Team size,<br># application users | Total hrs budgeted,<br>Total $ budgeted | # steps | KSLOC, (FP),<br>Pages document |
| | Labor rate | % effort completed,<br>Cost variance<br>(planned vs. actual) | cost by CAPP,<br>effort by CAPP,<br>Defect cost | $/KSLOC, $/page,<br>$/application |
| **Schedule**<br><br>**Quality**<br>**Level 1** | Actual hours<br>Available hours | % Time completed,<br>Schedule variance<br>(planned vs. actual) | steps completed,<br>Reviews completed/<br>Total # reviews,<br>Tests completed/<br>Total # tests, etc. | products completed,<br>Programs coded/<br>Total # programs,<br>Reqmts traced/<br>Total # reqmts, etc. |
| | Defect correction<br>rate, MTTR | # of requirement<br>changes | # defects per process<br>downtime, MTTF | # defects per product,<br>complexity |
| **Quality**<br>**Level 2** | Closed requests/<br>per report period<br>(productivity) | Defects delivered<br>(effectiveness) | Defects discovered<br>by phase,<br>Age of open defects | Customer satisfaction |

# Measures Change

**OPTIMIZED**

Process Change Management
Tech. Change Management

**PROCESS LEVEL**

Defect Causal Analysis
Technology Insertion Analysis
Productivity

**MANAGED**

Software Quality Management
Quant. Process Management

**PRODUCT LEVEL**

Quality Metrics
Reliability
Design
Volatility

**DEFINED**

Peer Reviews
Software Product Engineering
Integrated Software Management
Training Programs
Organization Process Definition
Organization Process Focus

**APPLICATION LEVEL**

Complexity
Performance
Cost

**REPEATABLE**

Software Configuration Management
Software Quality Assurance
SW Project Tracking and Oversight
Software Project Planning
Requirements Management

**QUALITATIVE LEVEL**

Size
Effort
Defects (categorization)
Cycle Time (schedule)

**INITIAL**

EM&I
PARTNERSHIP   INNOVATION   RESULTS

# Comparative Analysis



Prior Baselines

Current Baseline

Benchmarks

Project Histories, Other Baselines

# Choosing the Right Measures

- **Measures must be ACTIONABLE.**
- **Identifiable contribution to**
  - Business decisions
  - IT decisions
- **Measures must be practical to collect.**
- **Keep the number of metrics SMALL.**
- **Understand the roll-up of measures into measures at other management levels.**

# Cautions about Metrics

- Indicators, not absolutes
- Only as good as the supporting data
- Must be understood to be of value
  - Business understanding
  - IT understanding
- Not for judging individual performance
- Cannot identify, explain, or predict everything
- Need iterative analysis from multiple viewpoints
- Avoid direct comparison of projects
- No single metric
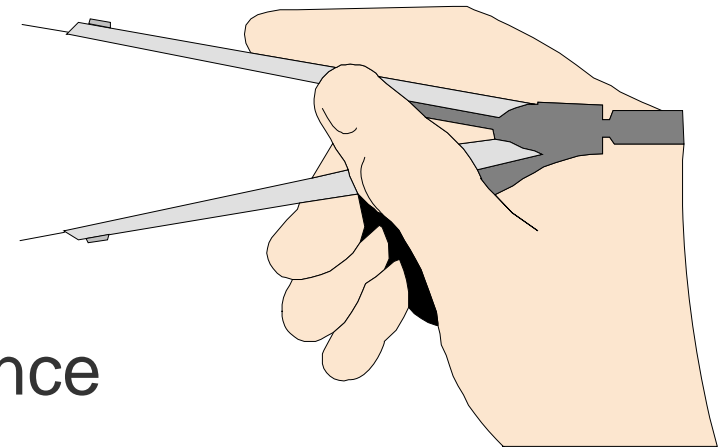
# Some Core Metrics – a starting point

| CHARACTERISTICS | UNIT OF MEASURE |
|---|---|
| Size      Progress<br>Reuse     Rework | Counts of physical code |
| Effort     Cost<br>Rework<br>Resource allocations | Counts of staff hours expended |
| Schedule | Calendar dates tied to milestones, reviews and audits, deliverable products |
| Quality   Rework<br>Readiness for delivery<br>Improvement trends | Counts of software problems and defects |

# Getting Started / Making Progress

## Priorities within a project:

- Understand the data you are getting now

- Standardize the content of future measurement reports

- Define and collect the additional information you need for project planning and tracking

## Priorities within an organization:

- Understand historical data you already have

- Get consistent data from project to project

- Get consistent data over time

EM&I
PARTNERSHIP   INNOVATION   RESULTS

# What should we measure, and why?

- Secure executive sponsorship
- Identify critical stakeholders
- Conduct facilitated workshops:
  - Business area leaders
  - IT leaders
- Evaluate proposed measures
- Develop balanced scorecards
- Focus on the alignment and translation of IT and Business objectives
- Make it visible
- Own the responsibility
- Tailor the reward system

# Lessons Learned

© 2010 EM&I
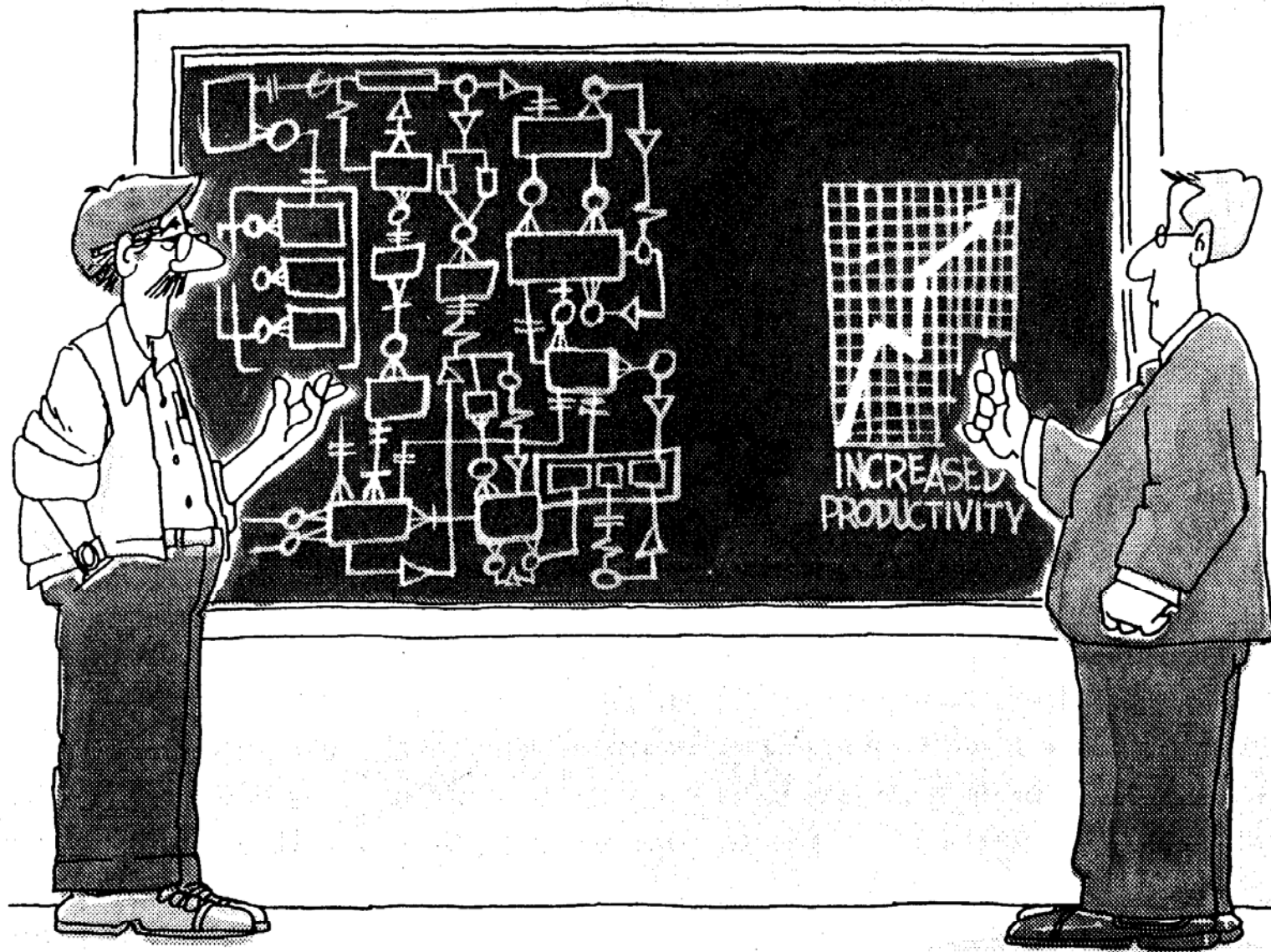
# For More Information

Engineering Management & Integration Inc.
455 Spring Park Place, Suite 350
Herndon, VA  20170
USA

+1 (703) 742-0585
www.em-i.com

Elliot Chikofsky                    +1 (781) 272-0049
EM&I
75 Lexington St              Elliot.Chikofsky@em-i.com
Burlington, MA 01803         Elliot.Chikofsky@dfas.mil
USA